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ABSTRACT

This paper identifies and describes four braille production systems that are currently in use: (1) manual--the printed material is transcribed onto braille, proof-read, corrected, and printed; (2) semi-automated--computers or microprocessors transcribe and/or translate the text from ink-print to braille but depend on a manual entry of the text to an applicable medium; (3) automated--compositor tapes are used as input to a computer for translation into braille; and (4) electromagnetic cassette braille-reading machines. The emphasis is placed on the present and future production of braille, but references are also made to the production of large print and synthetic speech, and the need for international formats and standards is discussed. (JD)

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A STATE OF THE ART OF BRAILLE: THE IDENTIFICATION OF POSSIBLE FORMATS OF BRAILLE PRODUCTION THAT WILL COUNTERACT RISING COSTS

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INTRODUCTION

Prior to offering visually handicapped people the same opportunities for education, vocational training and employment, as well as taking an active part in the general cultural and political debate in society, as their sighted peers, it requires in a great number of cases a well-established and fast functionning production system of reading material.

It is obvious that in a modern society with its growing flow of written information there is a need among visually handicapped people for extended access to this information - and produced at a higher rate of speed.

So far, the visually handicapped person has been deprived most of the printed material accessible to sighted people. A recent Danish survey shows that visually handicapped people in Denmark have access to approxemately two per cent of the fiction and poetry literature accessible to the sighted public. Textbooks, magazines, periodicals and other printed material for students and/or vocationally employed visually handicapped people are restricted to a minimum and often published weeks or months later than for their sighted colleagues.

This low level of information is, of course, a most unsatisfactory situation which makes the visually handicapped person, to an unacceptable high degree, dependent on sighted people to read for him or her.

However, the application of modern computer techniques in the printing industries seems to open up for an improvement of the present situation. In many countries research is already going on in how to produce reading material for visually handicapped people by applying modern computer techniques. (Appendix I).

In the following the emphasis will be placed on the present and future production of braille; but some reflections on the production of large print and synthetic speech will also be refered to.

PRODUCTION OF BRAILLE

An identification of various braille production systems applicable at the present moment includes,

(i) manual braille production

(ii) semi-automated braille production

(iii) automated braille production

(iv) a discussion of electromagnetic cassette-braille reading machines.

(i) MANUAL BRAILLE PRODUCTION

The majority of the braille texts are still produced in a manual way. The printed material is transcribed onto braille, proof-read, corrected and printed. A time-consuming and rather expensive production system.

For the braille reader it implies that he/she will have to wait for the material to be produced or accept an alternative text which is already produced. In both cases an unsatisfactory situation compared to the one of a sighted person.

Assuming that the producers of braille were not limited in their employment of transcribers, proof-readers and printers, the time-consuming transcription, proof-reading and printing processes would not be reduced radically.

Especially when it comes to meeting individual needs, which is frequently the case with students and vocationally employed people, the costs of production (including salaries to the transcriber, the proof-reader and the printer) are extremely high.

However, the greatest disadvantage of manual braille

published before you can even start planning the editing and the transcription of the braille master-copy.

The present manual production systems with master-copies on paper for vacuum forming and especially on zink-plates for pressing do prevent an international lending procedure to work effectively.

We have experienced in a number of cases that a book is already transcribed by another printing house.

However, if no copies are in stock it is too expensive for the printing house to set up the stereotyping machinary just to meet the order of one single copy.

Either the braille reader will have to wait for a copy to be available or make an alternative choice or the ordering library does a second transcription of the book. A time- and resource-waisting solution for the braille reader as well as for the library.

(ii) SEMI-AUTOMATED BRAILLE PRODUCTION

The term "semi-automated braille production" covers the various braille transcribing and printing facilities employing computers or microprocessors to transcribe and/or translate the text from ink-print to braille, but depending on a manual entry of the text to a medium applicable as,

a. direct control of a braille-embossing peripheral

b. input for a computertranslation into braille.

Such production systems are already in use in a number of European countries and in the United States.

Although the systems differ in actual hardware (i.e.

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keypunching device, video display terminal, computer, braille embosser) and software (i.e. editing and translation programmes) they do perform the same basic functions.

These functions are:

1. preparation and editing of the ink-print text; i.e. insertion of special instructions for the final arrangement and lay out of the braille copy;

2.

   a. manual transcription of the text into an ordinary compact cassette using an electronic braille keyboard in connection with a microprocessor control system for editing and correcting. The text can be transcribed in either contracted or non-contracted braille. The compact cassette constitutes the actual braille master;

   b. manual entry of the text onto an input medium readable by a computer using an ordinary keypunch machine or a terminal, including insertion of special editing codes indicating capitalization, numeral sign, italics, format controls like start new paragraph, force new line, force new page, tabulations, page numbers etc.... Conversion of print to braille by a computer using a translation program; the magnetic tape resulting from the translation constitutes the actual braille master;

3. embossing of a single copy for proof-reading, using a special braille-lineprinter;

4. insertion of corrections;

5. final output to either printing on an automatic zink plate embosser or a single copy paper embosser, or an interface for reproduction of magnetic tapes for a cassette-braille reading machine.

Phase 1. and 2.a. and b. do differ in time and costs from the purely manual transcription of an inkprint text using a stereotyping machine.

In the Danish system, based on punched cards, it takes the keypunch operator three days to enter a book of 250 pages, equivalent to approxemately 450 - 500 braille sheets printed on one side of the paper.

An experienced braillist using a Perkins brailler should be able to cope with such a rate of speed, whereas the time for stereotyping the same book would be almost the double.

A significant difference between a manual production and the computer system as described in 2.b. is, however, that the computer system allows persons having little or no braille skills to provide input to the producing computer system.

The application of an electronic braille keyboard or a terminal reduces further the entry time compared to the punched cards production method and improves the possibilities of a faster and more flexible way of correcting and editing of the text.

Other advantages of the two systems are the direct control of a high speed lineprinter (for small editions) or an automated stereotyper (for large editions) by the magnetic tape, and the safe of storage place. Furthermore the problem of up-dating already transcribed textbooks will be simplified. With the braille master on paper or zink plates major changes of the text often require a retranscription of the whole text. When the text is stored on a magnetic tape it is possible to enter only the necessary alterations.

The substantial advantages of system 2.b. are found in the actual translation from print to braille by the computer and the printing of braille copies.

The Danish translation program operates at a rate of 8.000 - 15.000 words/minute corresponding to approxemately two minutes for the translation of a book of 250 pages and the time for printing of a single braille copy of 400 braille sheets on the braille lineprinter is 20 - 30 minutes.

A further advantage of the Danish system is the option of supplying the braille copy in non-contracted, Grade 1½ or Grade II braille on request.

If only all existing and future computerized systems contained simular facility it would bring the standing discussion of contracted versus non-contracted braille to an end. The possibility of choosing between a contracted and non-contracted braille copy is due to the elaboration of the translation program.

The translation program is designed to be a tabledriven program, i.e. that the translation is controlled by tables ("The Dictionary") containing the rules for translation into Grade II braille, rather than being controlled by the program itself.

Since the program is table driven a table switching mechanism is included. The switching mechanism is able to handle the switching from one braille system to another (e.g. contracted to non-contracted, Danish to English, Danish to German etc...).

The translation program is not changed, but only the pointers to the tables, which gives the option within a text to switch from one system to another. Furthermore, the translation to grade 1 braille is simplified by the one-to-one relation between the inkprint character and the braille character.

The disadvantage of the described system is obviously phase 2., the manual transcription of the text and that the printed material has to be published before

a braille production can take place. This is of particular significance in the case of producing educational material for students and special literature for certain categories of vocationally employed people.

(iii) AUTOMATED BRAILLE PRODUCTION

A direct access to printed material or with a minimum of human intervention seems possible by applying compositors tapes used in the printing industry for production of inkprint texts.

If the text is available in machine-readable form on a magnetic or papertape for composition of inkprint it is already demonstrated feasible to use the composition tape as an input to a computer translation into braille.

The application of computer composition in the printing industry has expanded rapidly in the last few years and an adaption of this technique to the production of reading material for visually handicapped people indicates a radical change in future production systems.

Research is already going on in several countries how to use computercomposition tapes in producing not only braille but also large print and synthetic speech of ink print books, periodicals and journals.

So far successful trials have been made in Denmark, The Netherlands, Norway, United Kingdom and United States. One of the main problems in the application of compositors' tapes for braille production is that the tapes are provided with composition codes. Some of these codes are useless in braille (e.g. bold-face, petit, italic, page format, etc...) and have to be identified and removed or transformed before the tape can serve as an input to computerized braille production. However, this process can be accomplished by a special computer interface program - a so-called preprocessor.

Unfortunately there is very little standardization of composition codes within the publishing industry. This situation might result in the need for elaboration of a preprocessor for each publishing company.

In this case it is recommandable

1. that an international list should be worked out of preprocessors and the respective publishers;

2. that the preprocessors be kept in one of the major computer languages in order to fit into as many computer systems as possible.

Another problem arising from using compositors' tapes and which requires thorough attention is the question of copyright.

So far the publishing industry has been most cooperative in the attempts to make use of their composition tapes for braille production; but if the undergoing research shows that text on machinereadable form also can be used for production of large print and synthetic speech the publishers might be more reluctant.

Furthermore, in a future production system based on machine-readable text we suggest the international exchange of reading material for visually handicapped people based on an exchange of converted magnetic tapes instead of an actual copy of the book. At present such an international lending procedure would almost be impossible because of the different copyright laws.

The computer technical problems involved in such a procedure require probably a greater international unification of formats and standards for all kinds of digitally encoded texts.

Another solution would be that each system contained its own format control facility. In that case the master

tape did not need a justification to a specific format, but could serve as a master for an automatic zink plate embosser, an automatic lineprinter, reproduction of tapes for an electronic braille-reading machine or synthetic speech. Likewise, the text could be printed in Grade 1, 1½ or 2 braille on request.

Current research indicates so far that a future computerized braille production based on compositor tapes will result in:

1. much shorter production time, in principle it should be technical feasible to issue the braille edition at the same time as the inkprint one;

2. considerable extension of the access to printed material for visually handicapped people;

3. possibility of continous up-dating of texts printed from compositor tapes;

4. apparent reduction of costs, hence more brailled material for the same budgeted money;

5. flexibility in the choice of format

Production experience over a longer period of time will be required before these advantages can be determined and quantified.

With reference to the report "Compositor Tapes and Library of Congress Braille Production" by Henry B. Paris, Jr. and Bruce E. Miller, presented to the London Conference on computerized braille production, May/June 1979, an envisioned braille production system based on compositor tapes will contain:

1. a receiving terminal for an error-correcting communication system to permit electrical transfer of material from publishers to braille printing houses;

2. an edit system to facilitate both manual entry and proof-reading error correction;

3. a magnetic tape storage medium;

4. a computer capable of running the compositor tape conversion software and a print to standard-English braille conversion program;

5. a peripheral capable of producing highspeed single-sided braille proof copy;

6. a peripheral capable of producing highspeed interpoint zinc plates; and

7. an interface for cassette-braille reading machines.

The cost of implementing this system is estimated from $30,000 to $100,000 depending on the production facility.

In the future setting-up of computerized braille production systems it would be recommandable with a maximum of international standard in the elaboration of translation programs so that translation programs could be exchanged independently of individual printing systems. The facility always being able to produce a text in grade one braille, the possibilities of international exchange of pre-processors and translation programs as well as the exchange of master tapes without justification to a specific format may be a future way of reducing the costs of braille production.

In a discussion of making use of compositors tapes for the production of braille I find it indespensable not bringing forward some considerations about the production of large print from photocomposition tapes.

In my opinion production of large print should be the responsibility of a library service for the visually handicapped rather than left with commercial publishers.

In a modern library service system for visually handicapped people I do imagine the production of large print according to individual needs as just an essential part of the production as braille and speech.

The production of large print from photocomposition tapes and in accordance with the individual needs of the partially sighted is technical feasible, but, at the present moment the costs of such a production are extremely high.

I suggest, however, that further investigations should be made how to reduce these costs.

(iv) ELECTROMAGNETIC CASSETTE BRAILLE-READING MACHINES

The braille material, digitally stored on an ordinary C60 or C90 cassette is one of the possible formats of a computerized braille production system.

A number of cassette-braille reading machines are already on the market.

Beside the book-reading function they all perform various additional facilities such as connection of an electric typewriter, a calculator and a computer terminal.

The book-reading function is restricted to a braille display presenting one line at the time. The lenght of the line varying from 12 to 48 characters.

The electronic storage of braille on cassettes reduces the bulk of conventional braille texts dramatically. Approximately 400 - 700 pages of paper braille reading material can be stored on a single C60-cassette, an obvious advantage for both producers and consumers.

The text is called up through the braille keyboard

and released continously to the braille-display line according to the user's reading speed.

However, as a book-reading device, the machine presents one essential disadvantage, the reduction of the ordinary two-dimensional braille page to a one-dimensional presentation of the text, even though - as with the Braillex cassette-reading machine an advanced searching system has been developed in order to eredicate this disadvantage.

The two-dimensional reading-technique enables the reader to glance through the page making use of both hands which is of particular importance with tables and other paragraphed and listed texts. So far, a full page braille display has not been produced, but in laboratory it has been shown feasible. In the future development of cassette-braille reading machines it should be one of the improvements requiring thorough investigations.

Another serious problem is the question of international standardization and unification of formats for braille cassettes. At the present moment the format is determined by the technical data of the reading machine which reduces the possibilities of international exchange of braille cassettes. This situation should not be accepted by any library service for the visually handicapped having in mind the limited resources for production of reading material. It is imperative that a co-operation between producers of braille-cassette reading machines does take place in the future development and research. Otherwise, if left to develop unsupervised, on a national and commercial basis only, the future production of braille-cassette reading machines can interpose even more and greater obstacles to international sharing of resources.

CONCLUSION

The objective of a higher degree of unification of formats and standards in the future production of braille material is dual:

(i) for the producers to counteract rising costs of production by an international sharing of resources.

(ii) for consumers to have extended access to written material for recreational, educational and vocational purposes.

The two groupes, producers and consumers, are both represented by their respective international organisations.

The producers by IFLA and the consumers by WCWB (World Council of the Welfare for the Blind) and IFB (International Federation of the Blind), and a cooperation has been established between IFLA and WCWB.

In the development and research of more efficient production systems based on modern technology the cooperation with electronic industries is desirable and necessary.

However, the commercial aspects of cooperating with the industries require a thorough attention and consideration due to the risk of the development of incompatible products.

The influence of international, nonprofit bodies like IFLA and WCWB is therefor imperative in order to achive the highest possible compability in the development and presentation of new products.